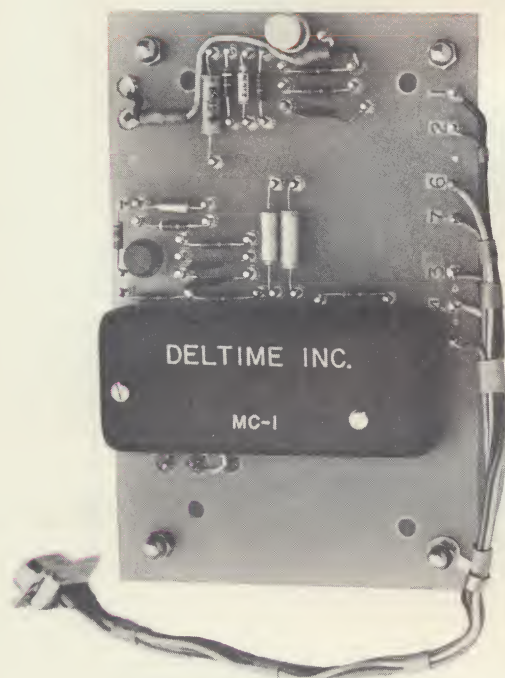




Sine Wave Carrier Circuit Module MC-1 for Magnetostrictive Delay Lines

4,000 usec Delay at 1 mc

Part Number A-22280

Description:

A linear amplifier, designed specifically for delay of modulated sine waves and complex signals with a magnetostrictive delay line, is packaged as a single compact module. Combining it with a delay line results in a complete input-output time delay module with an overall power gain of unity. An input stage drives the delay line; 3 stages amplify the delay line output restoring it to the input power level.

SPECIFICATIONS

Carrier Frequency:	1 mc $\pm 20\%$
Bandwidth:	1mc at -3 db
Ripple within bandwidth:	± 1 db
Output vs Input Linearity:	$\pm 10\%$
Dynamic Range:	20 db
Types of Modulation:	AM, FM, or Pulse Modulation
Signal to Noise Ratio for 100% Pulse Modulation:	10/1
Delay:	4,000 usec maximum
Nominal Unmodulated Input Conditions:	1 volt rms Input impedance 600 ohms
Nominal Unmodulated Output Conditions:	1 volt rms Load impedance 600 ohms
Power Supply:	+12 vdc $\pm 10\%$, 50 ma -12 vdc $\pm 10\%$, 55 ma
Temperature Range:	0°C to +55°C, operating -55°C to +80°C, storage
Size:	7/8" x 3 1/2" x 5 5/16"
Recommended Delay Lines for 1 mc bandpass:	up to 150 usec delay, Deltime Model 170 " 1,500 usec delay, Deltime Model 192C " 4,000 usec delay, Deltime Model 197C



MODEL MC-1
P.I. No. A-22280

Unity Gain Digital Circuit Module with Model 192A Magnetostrictive Delay Line



2,000 usec Delay at 1 mc PRF

Part Number A-22281

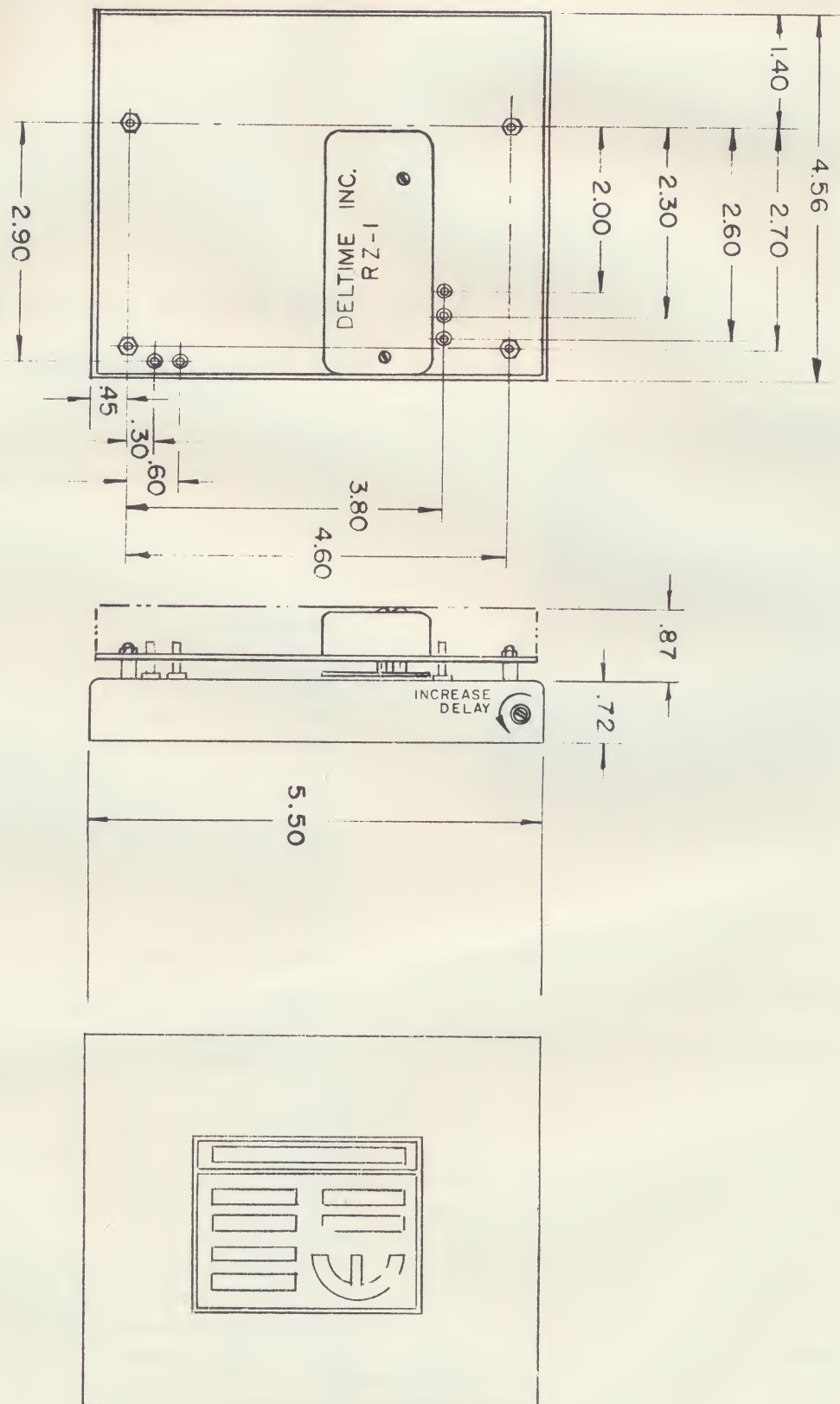
Description:

A digital write-read amplifier for magnetostrictive delay line applications is packaged as a single compact module. Combining the circuit module with a delay line results in a complete input-output module for obtaining long time delays. The write amplifier drives the delay line, the read amplifier amplifies the delay line output and restores the input pulse waveform. The addition of external clocking with a feedback loop results in a recirculating memory for digital data storage.

SPECIFICATIONS

*Delay Range:	2,000 microseconds maximum
Mode:	Return to Zero
Pulse Repetition Frequency:	1 mc maximum
Input:	Logic Level: -6.6 ± 1.5 volts Pulse Width at 50% amplitude: 0.45 ± 0.10 usecs Rise and Fall times: 0.15 usec max., 0.08 usec for 1 mc operation Nominal Impedance: 3.6k shunted by 47 pfd
Output:	Delayed Logic Level: -6.6 volts; +0.2, -0.5 volts Current: 0 to 10 ma at -6.6 volts Pulse Width at 50% amplitude: 0.50 usec; +0.05 usec; -0.00 usec, at 25°C Pulse Width variation with temperature: +0.04 usec at 0°C, -0.07 usec at 55°C Nominal Load Impedance: 1.2k ohms shunted by 47 pfd
Power Supply:	+12 volts $\pm 10\%$ 16 ma maximum -12 volts $\pm 10\%$ 70 ma maximum below 1kc prf 120 ma maximum at 1 mc prf
Operating Temperature Range:	0°C to +55°C
Storage Temperature Range:	-55°C to +80°C
Overall Dimensions:	1 11/16" x 4 9/16" x 5 1/2"

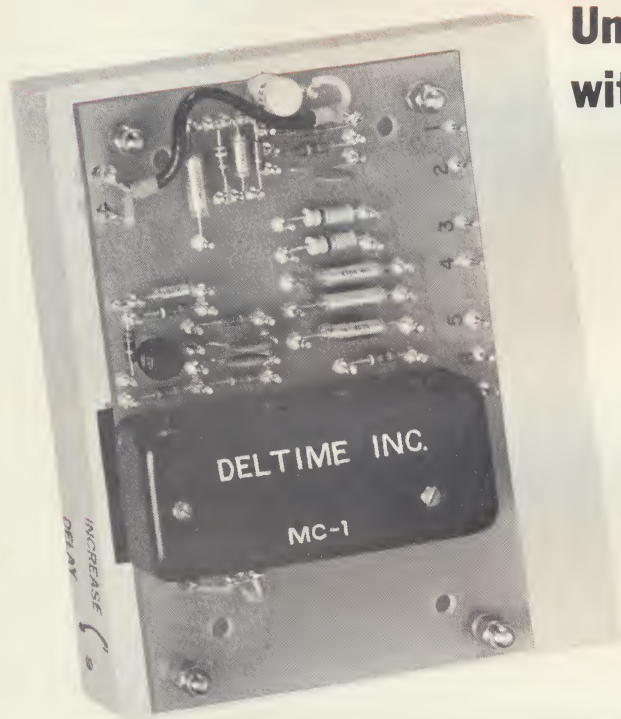
*Delay is factory adjusted to customer's requirement



Max Delay Length 2100 usec.

THESE DRAWINGS & SPECIFICATIONS SHALL NOT BE REPRODUCED WITHOUT WRITTEN PERMISSION

MATERIAL:		FINISH:		SPEC:		CUST. NO.:		SCALE:	
UNLESS SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES FRACTIONS DECIMALS ANGLES $\pm .020$ $\pm .010$ $\pm .005$ $\pm .001$ $\pm .0005$ $\pm .0001$									
DO NOT SCALE DRAWING - WORK TO DIMENSIONS SHOWN  139 HOYT STREET MANHATTAN, N.Y. PHONE: 8-5600									
DATE	BY	CHKD	APPRD	DATE	BY	CHKD	APPRD	DATE	BY
MODULE 192-A WITH RZ-1								PT. NO.	REV.
								A-22281	



Unity Gain Carrier Circuit Module with Model 192C Magnetostrictive Delay Line

1,500 usec Delay at 1 mc

Part Number A-22271

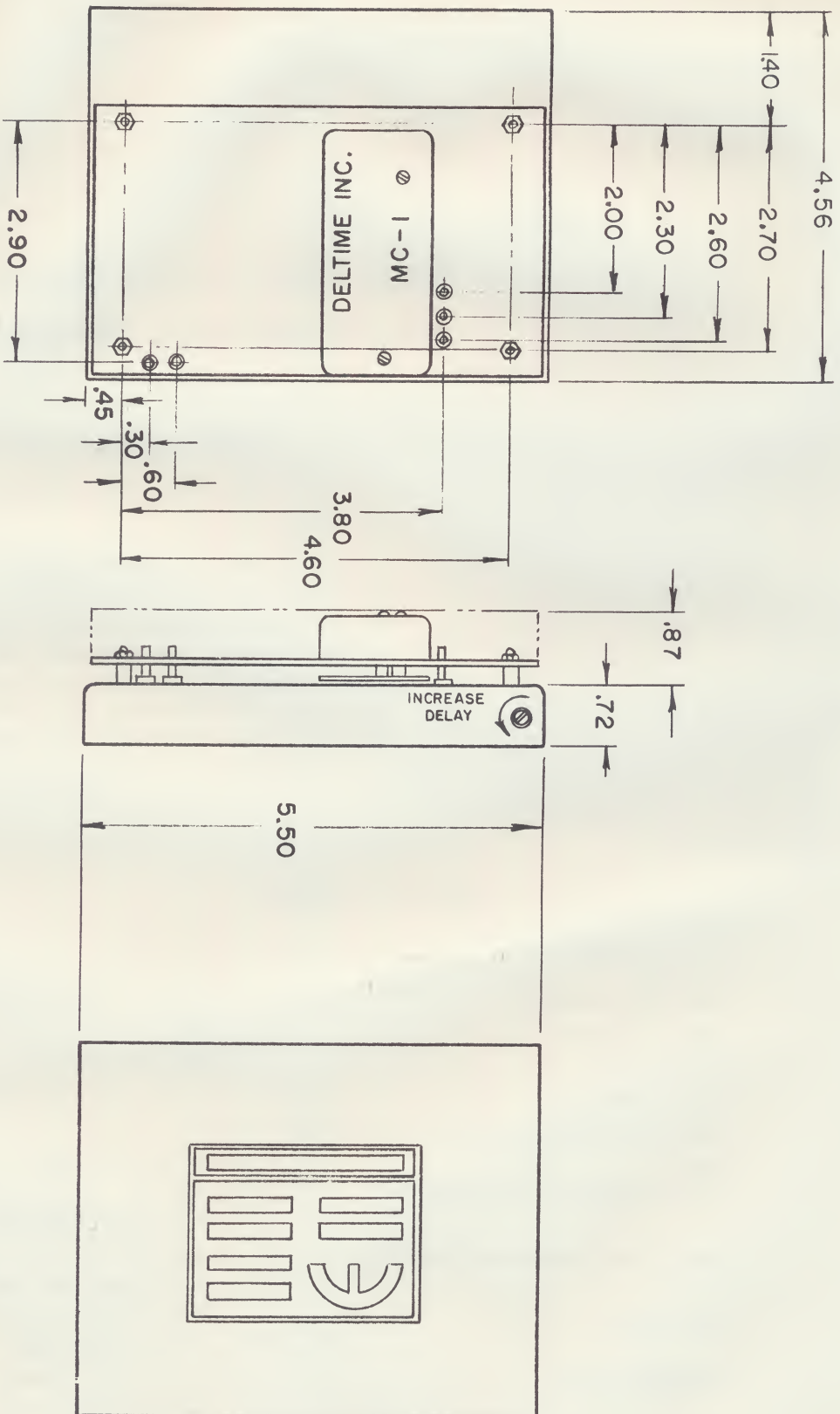
Description:

A linear amplifier, designed specifically for delay of modulated sine waves and complex signals, is packaged as a single compact module. Combining it with a delay line results in a complete input-output time delay module with an overall power gain of unity. An input stage drives the delay line, 3 stages amplify the delay line output restoring it to the input power level.

SPECIFICATIONS

Carrier Frequency:*	1 mc $\pm 20\%$
Bandwidth:	1mc at -3 db
Ripple within bandwidth:	± 1 db
Output vs Input Linearity:	$\pm 10\%$
Dynamic Range:	20 db
Types of Modulation:	AM, FM, or Pulse Modulation
Signal to Noise Ratio for 100% Pulse Modulation:	10/1
Delay:	1,500 usec maximum
Nominal Unmodulated Input Conditions:	1 volt rms Input impedance 600 ohms
Nominal Unmodulated Output Conditions:	1 volt rms Load impedance 600 ohms
Power Supply:	+12 vdc $\pm 10\%$, 50 ma -12 vdc $\pm 10\%$, 55 ma
Temperature Range:	0°C to +55°C, operating -55°C to +80°C, storage
Size:	1 11/16" x 4 9/16" x 5 1/2"

*Operation at lower carrier frequencies available on special order.



MAX. DELAY LENGTH: 1,500 μ SEC

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UNLESS SPECIFIED OTHERWISE DIMENSIONS ARE IN INCHES.									
TOLERANCES:									
FRACTIONS: $\pm .020$ ANG.									
DECIMALS: $\pm .005$ $\pm 1/20$									
DATE: 12/10/03									
 139 HOYT STREET MANHATTAN, N.Y. PHONE: 212-698-5600									
DESIGNED BY: [Signature]		CHECKED BY: [Signature]		APPROVED BY: [Signature]		DATE: 12/10/03		REV.:	
PT. NO. A-22271		MODEL 192-C WITH MC-1							

Unity Gain Carrier Circuit Module with 197C Magnetostrictive Delay Line

4,000 usec Time Delay a 1 mc
PART NUMBER A-22272

Description:

A linear amplifier, designed specifically for magnetostrictive delay line carrier applications, is packaged as a single compact module. Combining it with a delay line results in a complete input-output time delay module with an overall power gain of unity. An input stage drives the delay line; 3 stages amplify the delay line output restoring it to the input power level.

SPECIFICATIONS

Carrier Frequency:	1 mc $\pm 20\%$
Bandwidth:	1 mc at -3 db
Ripple within bandwidth:	± 1 db
Output vs Input Linearity:	$\pm 10\%$
Dynamic Range:	20 db
Types of Modulation:	AM, FM, or Pulse Modulation
Signal to Noise Ratio for 100% Pulse Modulation:	10/1
* Delay:	4,000 usec maximum
Nominal Unmodulated Input Conditions:	1 volt rms Input impedance 600 ohms
Nominal Unmodulated Output Conditions:	1 volt rms Load impedance 600 ohms
Power Supply:	+12 vdc $\pm 10\%$, 50 ma -12 vdc $\pm 10\%$, 55 ma
Temperature Range:	0°C to 55°C, operating -55°C to 80°C, storage
Size:	13 11/16" x 11" x 1 9/16"

*Delay is factory adjusted to customer's requirement



Model 192A Magnetostrictive Delay Line

2 Millisecond Delay 1 mc PRF RZ

Part Number A-22286

SPECIFICATIONS

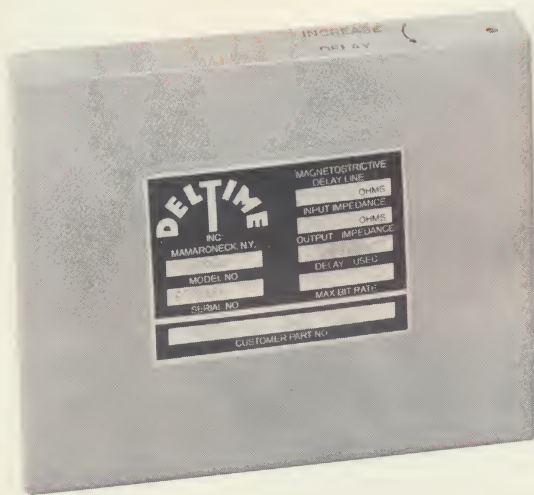
DELAY:*	2,000 microseconds maximum
PULSE REPETITION RATE:	1 mc maximum
MODE:	Return to Zero
DELAY ADJUSTMENT RANGE:	± 2 microseconds

TYPICAL 1 mc OPERATING CHARACTERISTICS

Input:	Voltage	10 volts
	Pulse Width	.35 to .50 usec at 50% amplitude
	Rise and Fall Time	.08 microseconds maximum
	Peak Current	80 milliamps
	Source Impedance	50 ohms minimum
	Input Parameters	16 ohms in series with 20 uhy
Output:	Voltage	10 mv minimum across 4.7k at 25°C
	Signal to Noise Ratio	6/1 minimum with any random pulse pattern

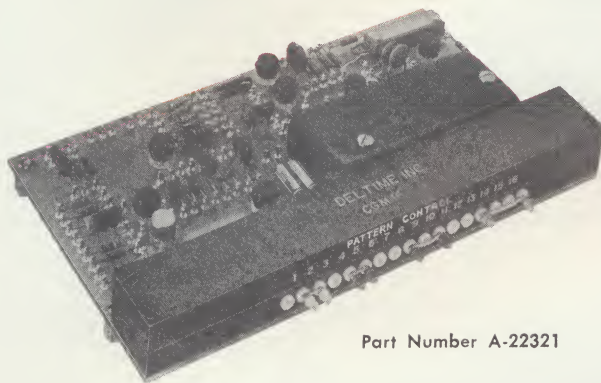
Temperature Coefficient of Amplitude:	--20% maximum at 0°C +15% maximum at +50°C
2 Millisecond Delay Drift:	+.20 usec max. total drift 0°C to 50°C
Temperature Coefficient of Delay:	Non Linear, ± 5 ppm/°C maximum
Temperature Range:	0°C to +55°C operating -55°C to +80°C storage
Shock and Vibration:	Operating — ground environment Non-Operating--Vibration Mil STD 202A method 201A Non-Operating--Shock Mil STD 202A method 202A: 30 G's Mil STD 202A Method 103A: 240 hours
Humidity:	
Case Material:	Steel
Seal:	Solder sealed to resist moisture and dust
Size:	4 9/16" x 5 1/2" x 23/32", excluding terminals and mounting studs.
Weight:	1.2 lbs.
Recommended Circuitry:	Delttime Circuit Module RZ-1
Input to RZ-1 Module:	-6.6 volts, .35 usec to .50 usec pulse width
Delayed Output of RZ-1 Module:	-6.6 volts, .50 usec pulse width
RZ-1 Module Power Supply:	+12 volts 17 m.a.
	-12 volts 120 m.a.

*Delay is factory adjusted to customer's requirements.



DATE: April, 1964

16 BIT 1 MC SERIAL PATTERN GENERATOR CGM-16



Part Number A-22321

APPLICATION DATA

The CGM-16 offers the engineer a versatile and easy to operate digital module for performing complex tests on tapes, drums, magnetic heads, cores and sonic delay lines. By stacking several CGM-16 modules, parallel as well as extended serial patterns can be produced. A 32 bit serial pattern can be generated with 3 CGM-16 modules, one serving as a 16 μ sec. delay module for a second channel.

OTHER APPLICATIONS ARE:

1. Permanent word-oriented 16 bit serial memory available on trigger command. No additional circuitry required.
2. Variable unity gain delay line, approximately 2.5 to 18.5 μ sec. delay in 1 μ sec. steps. No additional circuitry required.
3. Variable pulse width generator, 1 to 15 μ sec. wide in 1 μ sec. steps for variable gates and 500 kc NRZ patterns; output flip-flop required.
4. 1 MC random pattern trigger for high power pulse generators. A -12 volt trigger is available by simple modification of CGM-16 output stage.
5. Pulse repetition rate multiplier: — various input trigger rates can be converted to higher rates by appropriate selection of pulses in the output pattern, e.g. 100 kc can be converted to 200 kc, 500 kc, and 1 mc.

DESCRIPTION

The CGM-16, is a solid state digital module weighing only 8 ounces, providing a programmable 16 bit serial pattern of return-to-zero pulses. 2^{16} random combinations of ones and zeros are obtainable which can be synchronized with a 1 Mc external clock. Output pulses have fixed characteristics of -6.6 volts amplitude, 0.5 μ sec. width, and 1.0 μ sec. spacing. An external trigger and DC power source are the only electrical signals required for operation. The pattern repetition frequency is controlled by the input trigger which can be any rate to 62.5 Kc for a full 16 bit pattern. Patterns are programmed by inserting miniature jumpers into Teflon insulated PATTERN CONTROL jacks mounted on the front panel. In the absence of jumpers, all 16 pulses appear at the CGM-16 output terminals (Fig. 1). Inserting a jumper between any two jacks removes pulses in the pulse train in direct correspondence to the span of the jumper (Fig. 2). One jumper can be used to remove one pulse or all 16 pulses. The CGM-16 is ideally suited as a component for permanent installation in digital instruments and consoles. A 9/32" x 4" panel access slot permits easy manipulation of jumpers when the CGM-16 is flush mounted on the rear surface of panels up to 3/16" thick (Fig. 3).

THEORY OF OPERATION

The CGM-16 is a space-to-time converting device which accomplishes its function through the unique design of a multi-tapped sonic delay line. A shock pulse, which propagates down the length of a sonic conductor at the speed of sound, is initiated by an electrical pulse applied to the input coil. 16 inter-connected output coils, uniformly distributed in space along the length of the sonic conductor, convert this single shock pulse into 16 electrical output pulses uniformly distributed in time. The property of magnetostriction is utilized for energy conversion. After the shock pulse passes through the output coils, its energy is absorbed by acoustic damping material to eliminate reflections.

Any combination of output coils can be shorted without disturbing the pulses induced in coils remaining active. The electrical pulse train thus formed is fed into a common amplifier and reshaped to deliver a pulse pattern of fixed logic level.

This novel technique of space-to-time conversion is accomplished by a short magnetostrictive delay line and only 10 transistors, explaining the simplicity and compact size of the CGM-16.

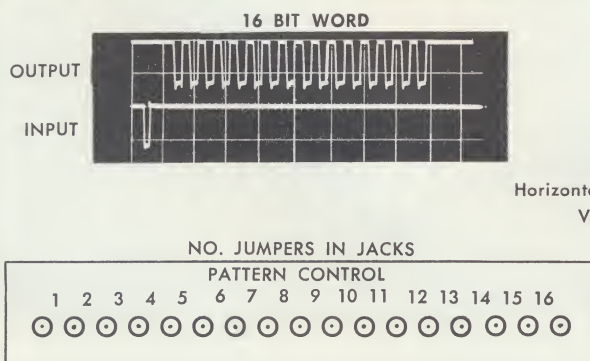


Fig. 1

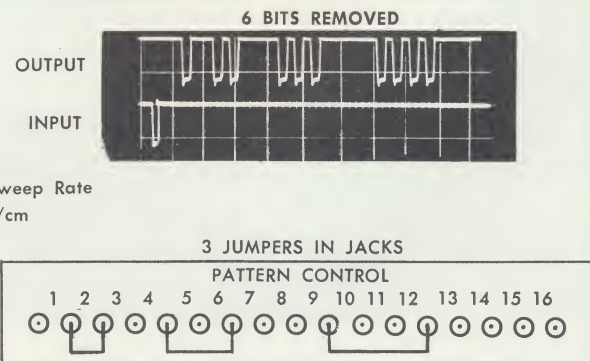


Fig. 2

SPECIFICATIONS

INPUT TRIGGER REQUIREMENTS

Amplitude:	—6.6 volts nominal into 3.6K in shunt with 47 μ f.
Width @ 50% Amplitude:	.3 μ sec. nominal. Operation with .5 μ sec. wide trigger changes output pulse spacing .050 μ sec. and increases jitter .010 μ sec.
Rise and Fall Time:	.080 μ sec. maximum.
Repetition Frequency:	1 Mc Max. 62.5 Kc for 16 Bit Word

OUTPUT PATTERN CHARACTERISTICS

Mode:	Return to Zero.
Number of Pulses:	Up to 16*.
Method of Pattern Control:	Programmable with miniature jumpers.
Pulse Spacing:	1.0 μ sec., $\pm$.10 μ sec. (not cumulative); Can be synchronized with 1 Mc clock.
Jitter due to Pattern Variations:	$\pm$.05 μ sec.
Delay of First Output Pulse after Input Trigger:	2 μ sec.
Max. 16 bit pattern repetition rate:	62.5 Kc.

*Note: Up to 24 Pulses also available.

INDIVIDUAL OUTPUT PULSE CHARACTERISTICS

Amplitude:	—6.6 volts.
Width @ 50% Amplitude:	.50 μ sec.
Rise and Fall Time:	.10 μ sec. maximum.
Overshoot:	10% Maximum
Nominal Load:	1.2k ohms shunted with 47 μ f.

POWER SUPPLY REQUIREMENTS

—12 volts d.c. $\pm$ 10%:	70 ma at less than 1 Kc trigger repetition frequency. 120 ma at 1 Mc trigger repetition frequency.
+12 volts d.c. $\pm$ 10%:	16 ma.

TEMPERATURE RANGE

Temperature Range:	Operating 0°C to +50°C. Storage —55°C to +80°C.
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MECHANICAL SPECIFICATIONS

Size:	3-25/32" x 6-3/4" x 1-11/16" overall.
Mounting:	4 removable 4-32 internally threaded stand-offs, 2.59" x 6.44" corners.
Weight:	8 ounces.

PANEL MOUNTING DIMENSIONS

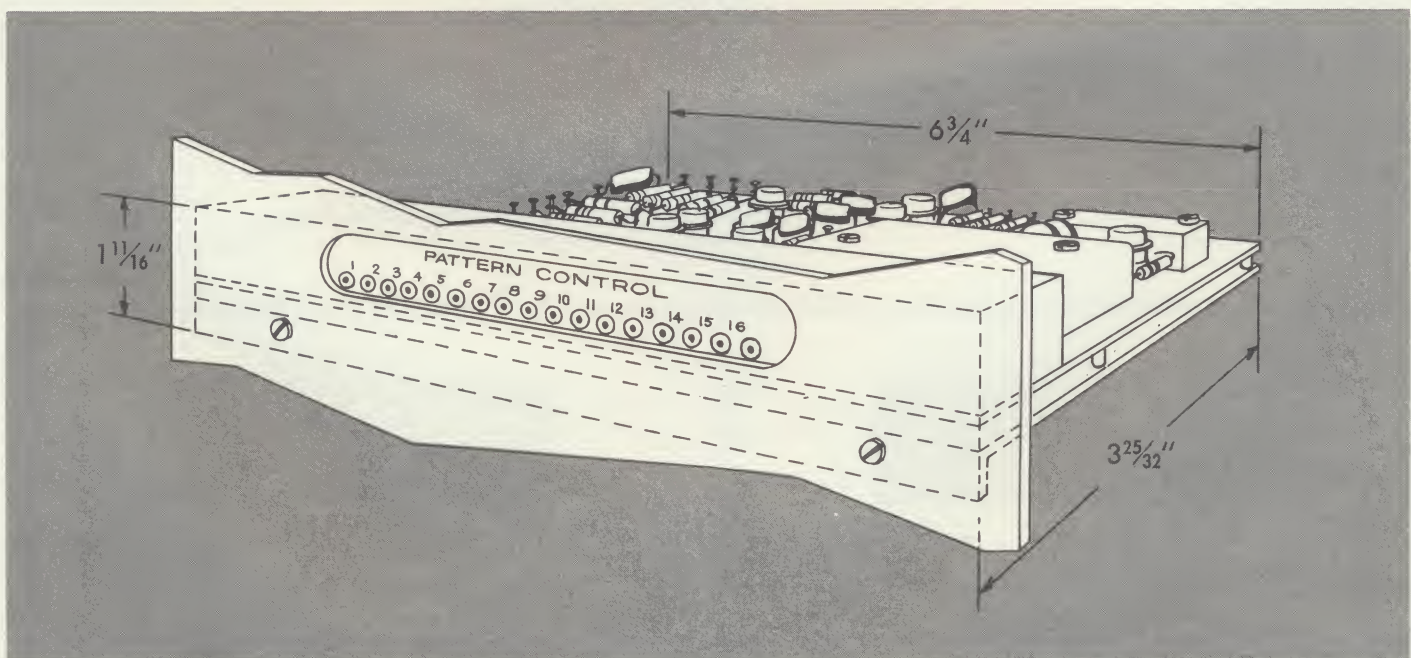
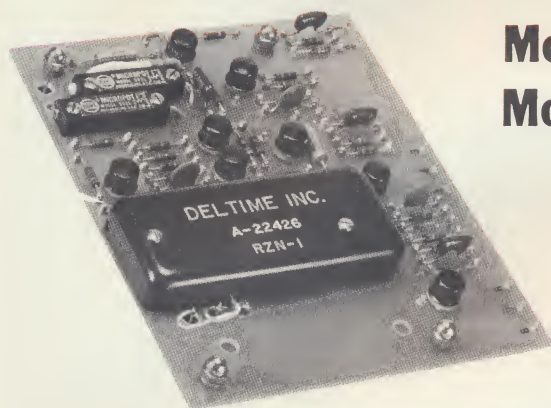


Fig. 3



Model RZN-1 Random Pulse Width Circuit Module for Magnetostrictive Delay Lines

PART #A22426

Description:

The RZN-1 is a complete input-output circuit module designed specifically for use with magnetostrictive delay lines to delay step functions, random pulse width or variable duty cycle pulses, non-return-to-zero digital information, or return-to-zero digital information.

The input circuit amplifies the input pulse and drives the delay line input coil with a current pulse. The output circuit amplifies, detects, and reshapes the delayed signal.

Digital data can be stored serially by adding a feedback loop with appropriate logic and an external clock.

SPECIFICATIONS

Delay Range:	5,000 microseconds maximum
Mode:	Return-to-Zero or Non-Return-to-Zero
Pulse Repetition Frequency:	D.C. to 1 mc maximum

Input to Write Amplifier

Logic Level	-6.6 volts nominal
Pulse width at 50% amplitude:	0.50 usec minimum, no limit on max.
Rise and Fall Time	0.15 usec maximum
	0.08 usec maximum for 1 mc operation

Nominal Input Impedance:	4.6k shunted by 47 pfd
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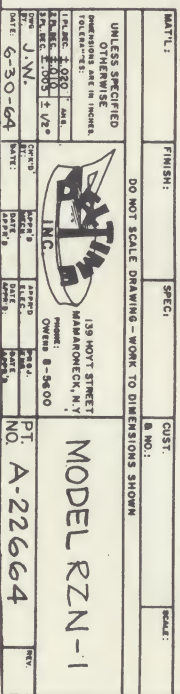
Output* of Read Amplifier after Delay

Nominal Load:	2.2k shunted by 33 pfd
Logic Level:	-9.0 volts at nominal load
Pulse Width:	Equal to input pulse width ± 0.08 usec.
Rise Time:	.075 usec maximum
Fall Time:	.050 usec maximum

Power Supply:	+12 volts $\pm 10\%$	8 ma maximum
	-12 volts $\pm 10\%$	50 ma in standby
		120 ma max. operating

Operating Temperature Range:	0°C to +55°C
Storage Temperature Range:	-55°C to +80°C
Overall Dimensions:	5 5/16" x 4 3/8" x 7/8"
Recommended Delay Lines:	1,000 usec max. Deltime Model 190A
	2,000 usec max. Deltime Model 192A
	5,000 usec max. Deltime Model 214A

* Complementary Outputs are provided.



NOTE:
"A" HOLES ARE FOR MOUNTING
"B" HOLES ARE CLEARANCE FOR TERMINALS

Model 214A Magnetostrictive Delay Line

10 MILLISECOND DELAY 1 mc PRF

PART #22338

SPECIFICATIONS

DELAY:*	10,000 microseconds maximum
PULSE REPETITION RATE:	1 mc maximum
MODE:	Return to Zero
DELAY ADJUSTMENT RANGE:	± 2 microseconds

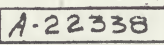
TYPICAL 1 mc OPERATING CHARACTERISTICS

Input:	Voltage	10 volts
	Pulse Width	.35 to .50 usec at 50% amplitude
	Rise and Fall Time	.08 usec maximum
	Peak Current	100 milliamps
	Source Impedance	50 ohms minimum
	Input Parameters	16 ohms in series with 20 uhy
Output:	Voltage	6 mv minimum across 8.2k at 25°C
	Signal to Noise Ratio	4/1 minimum with random pulse pattern

Temperature Coefficient of Amplitude:	--15% maximum at +15°C +15% maximum at +35°C
10 Millisecond Delay Drift:	+ .20 usec max. total drift +15°C to +35°C
Temperature Coefficient of Delay:	Non Linear, ± 5 ppm/°C maximum
Operating Temperature Range:	0°C to +55°C
Storage Temperature Range:	--55°C to +80°C
Shock and Vibration:	Operating -- ground environment Non-operating --will withstand normal handling and transportation
Case Material:	Steel
Seal:	Solder sealed to resist moisture and dust
Size:	10 1/2" x 11 1/2" x 7/16" excluding terminals and circuit mount standoffs
Mounting:	6-32 threaded inserts on 8 1/2" x 8 1/2" corners
Weight:	3.5 lbs.
Recommended Circuitry:	Delttime Circuit Module RZ-1
Input to RZ-1 Module:	--6.6 volts, .35 usec to .50 usec pulse width
Delay Output of RZ-1 Module:	--6.6 volts, .50 usec pulse width
RZ-1 Module Power Supply:	+12 volts 17 m.a.
	--12 volts 120 m.a.

*Delay is factory adjusted to customer's requirements.





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2 PL. CONC. 4" OR 5" ± ½"				
				
120 HOYT STREET MADISON, N.Y. Phone: _____				
OVERS B-5500				
QUANTITY	UNIT	APPROX. QUANTITY	APPROX. UNIT	PT. NO.
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139 HOYT STREET, MAMARONECK, NEW YORK

914 OWens 8-5600

BULLETIN NO.

DT-20

DATE

March, 1964

Model 213A Magnetostrictive Delay Line

5 MILLISECOND DELAY

1 mc PRF

PART #A22266

SPECIFICATIONS

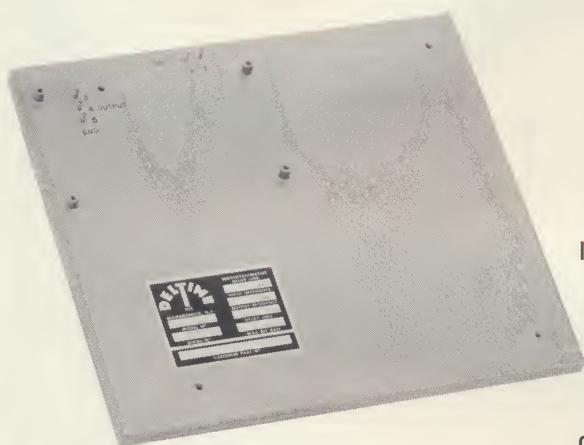
DELAY:*	5,000 microseconds maximum
PULSE REPETITION RATE:	1 mc maximum
MODE:	Return to Zero
DELAY ADJUSTMENT RANGE:	± 2 microseconds

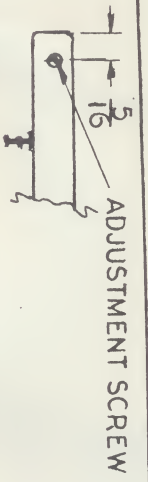
TYPICAL 1 mc OPERATING CHARACTERISTICS

Input:	Voltage	10 volts
	Pulse Width	.35 to .50 usec at 50% amplitude
	Rise and Fall Time	.08 microseconds maximum
	Peak Current	80 milliamps
	Source Impedance	50 ohms minimum
	Input Parameters	16 ohms in series with 20 uhy
Output:	Voltage	15 mv minimum across 4.7k at 25°C
	Signal to Noise Ratio	4.5/1 minimum with random pulse pattern

Temperature Coefficient of Amplitude:	—15 % maximum at +10°C +10% maximum at +40°C
5 Milisecond Delay Drift:	+ .20 usec max. total drift 10°C to 40°C
Temperature Coefficient of Delay:	Non Linear, ± 5 ppm/°C maximum
Temperature Range:	0°C to +55°C operating —55°C to +80°C storage
Shock and Vibration:	Operating — ground environment Non-operating — Will withstand normal handling and transportation
Case Material:	Steel
Seal:	Solder sealed to resist moisture and dust
Size:	9" x 10" x 7/16", excluding terminals and circuit mount standoffs
Mounting:	6—32 threaded inserts on 7 3/8" x 7 3/8" corners
Weight:	2.8 lbs.
Recommended Circuitry:	Delttime Circuit Module RZ-1
Input to RZ-1 Module:	—6.6 volts, .35 usec to .50 usec pulse width
Delayed Output of RZ-1 Module:	—6.6 volts, .50 usec pulse width
RZ-1 Module Power Supply:	—12 volts 120 m.a.
	+12 volts 17 m.a.

*Delay is factory adjusted to customer's requirements.

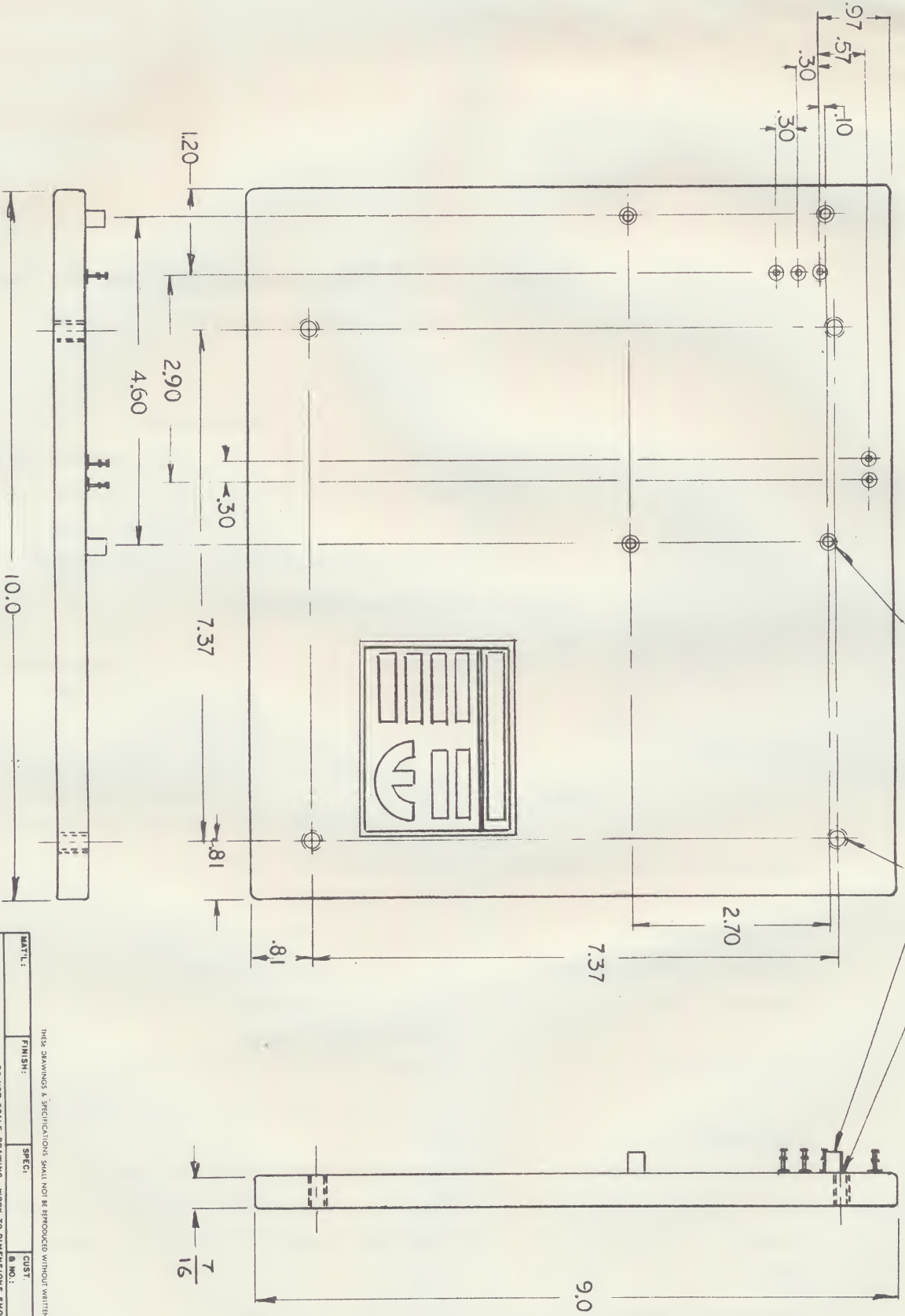




ADJUSTMENT SCREW

(4) STANDOFF #6-32NC-2B TH'D .18 DEEP

(4) 6-32 NC-2B THRU MOUNTING HOLE



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DIMENSIONS ARE IN INCHES									
TOLERANCES: ±.010									
FRACTIONS: 1/16, 1/8, 1/4, 1/2, 3/4, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000									
DATE: 3-21-63									
DRAWN BY: [Signature]									
CHECKED BY: [Signature]									
APPROVED BY: [Signature]									
TITLE: MODEL 213-A									
PART NO: A 22266									
REV: B									

A-22266

139 HOYT STREET, MAMARONECK, NEW YORK

914 OWens 8-5600

BULLETIN NO. **DT-21**

DATE **March, 1964**

Model 190A Magnetostrictive Delay Line

1 MILLISECOND DELAY 1 mc PRF

PART #A22467

SPECIFICATIONS

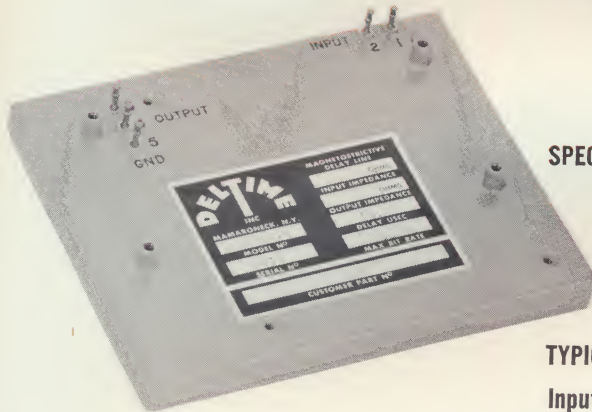
DELAY:* 1,000 microseconds maximum
PULSE REPETITION RATE: 1 mc maximum
MODE: Return to Zero
DELAY ADJUSTMENT RANGE: ± 2 microseconds

TYPICAL 1 mc OPERATING CHARACTERISTICS

Input:	Voltage	10 volts
	Pulse Width	.35 to .50 usec at 50% amplitude
	Rise and Fall Time	.08 usec maximum
	Peak Current	100 milliamps
	Source Impedance	50 ohms minimum
	Input Parameters	16 ohms in series with 20 uhy
Output:	Voltage	15 mv min. across 4.7k at 25°C
	Signal to Noise Ratio	6/1 min. with random pulse pattern

Temperature Coefficient of Amplitude:	-20% maximum at 0°C +15% maximum at +50°C
1 Millisecond Delay Drift:	+.15 usec max. total drift 0°C to 50°C
Temperature Coefficient of Delay:	Non Linear, ± 5 ppm/°C maximum
Temperature Range:	0°C to +55°C operating -55°C to +80°C storage
Shock and Vibration:	Operating -- ground environment Non-operating — Mil STD 202A Vibration method 201A, Shock method 202A, 30 G's Mil STD 202A Method 103A, 240 hours
Humidity:	
Case Material:	Steel
Seal:	Solder sealed to resist moisture and dust
Size:	4 3/8" x 5 5/16" x 7/16", excluding terminals and circuit mount standoffs
Mounting:	4-40 threaded inserts on 3 1/2" x 3 5/16" corners
Weight:	13.5 ounces
Recommended Circuitry:	Delttime Circuit Module RZ-1
Input to RZ-1 Module:	-6.6 volts, .35 usec to .50 usec pulse width
Delay Output of RZ-1 Module:	-6.6 volts, .50 usec pulse width
RZ-1 Module Power Supply:	+12 volts 17 m.a. -12 volts 120 m.a.

*Delay is factory adjusted to customer's requirements.



Technical drawing of a mounting circuit board. The drawing includes a side view at the top and a top view below it. The side view shows a rectangular board with a width of $\frac{5}{16}$ and a height of $\frac{7}{32}$. It features an adjustment screw on the left side, with a distance of $\frac{7}{16}$ from the bottom edge to the screw. The top view shows a rectangular board with overall dimensions of 2.00 by 1.60. The board has a central horizontal slot with a width of .30 and a depth of .10. There are four circular components labeled 1, 2, 3, and 4. Component 1 is at the top left, component 2 is at the top right, component 3 is at the bottom left, and component 4 is at the bottom right. Component 4 is labeled "OUTPUT". There are also two circular components labeled 5 and 6, both labeled "GND.". The distance from the top edge to the center of component 1 is 4.00. The distance from the top edge to the center of component 2 is 3.20. The distance from the bottom edge to the center of component 3 is .30. The distance from the bottom edge to the center of component 4 is .60. The distance from the left edge to the center of component 3 is .90. The distance from the left edge to the center of component 4 is .60. The distance from the right edge to the center of component 2 is .60. The distance from the right edge to the center of component 4 is .12. The text "#6-32 (4 INSERTS) FOR MOUNTING CIRCUIT BOARD" is written vertically on the right side of the drawing.

[illegible]

139 HOYT STREET, MAMARONECK, NEW YORK

914 OWens 8-5600

BULLETIN NO.

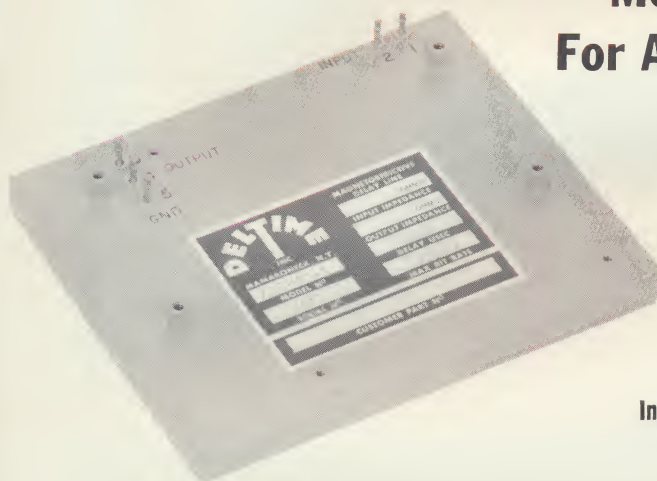
DT-23

DATE

August, 1964

Model 190M Magnetostrictive Delay Line For Airborne and High Vibration Environments

Part #A22541



SPECIFICATIONS

*DELAY:	1,000 microseconds maximum
PULSE REPETITION RATE:	1 mc maximum
MODE:	Return to Zero
DELAY ADJUSTMENT RANGE:	$\pm 1/2$ microsecond

TYPICAL 1 mc OPERATING CHARACTERISTICS

Input:	Voltage	10 volts
	Pulse Width	.35 to .50 usec at 50% amplitude
	Rise and Fall Time	.08 microseconds maximum
	Peak Current	100 milliamps max., 50% duty cycle at 71°C
	Source Impedance	50 ohms minimum
Output:	Input Parameters	108 ohms in series with 25 uhy
	Voltage	12 mv minimum across 4.7k at 25°C with peak input current of 100 m.a.
	Signal to Noise Ratio	5/1 minimum with random pulse pattern
	Under vibration without isolators per Mil - E - 5400	
	Curve I, 5 cps to 500 cps	

Amplitude Variation with Temperature:

+10% at +71°C
-30% at -54°C

Delay Variation with Temperature:

+ .20 usecs max. total drift -54°C to +71°C

Temperature:

-54°C to +71°C - operating
-62°C to +85°C - storage

Environmental:

Mil - E - 5400 Class I

Case Material:

Steel

Seal:

Solder sealed to resist moisture and dust

Size:

4 3/8" x 5 5/16" x 7/16", excluding terminals and circuit board mounting standoffs

Mounting:

4 4-40 threaded inserts on 3 1/2" x 3 5/16" corners

Weight:

13.5 ounces

Circuitry:

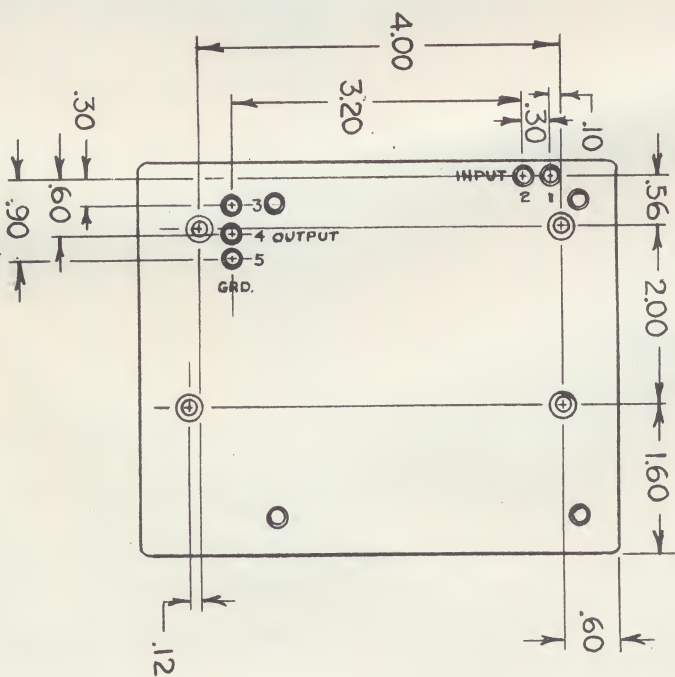
Delttime circuitry available on special order

*Delay is factory adjusted to meet customer's requirement. Delay is measured between 50% points of input and output pulses. Specify delay to nearest tenth of a microsecond.

Technical drawing of a rectangular plate. The overall dimensions are $5\frac{5}{16}$ (width) and $4\frac{3}{8}$ (height). The central logo is a stylized 'E' inside a square frame. The plate has four mounting holes, each with a diameter of $\frac{7}{16}$. The distance between the centers of the holes is $3\frac{5}{16}$ (width) and $3\frac{1}{2}$ (height). The distance from the top edge to the center of the top holes is $\frac{7}{16}$. The distance from the right edge to the center of the right holes is $\frac{7}{16}$. The distance from the left edge to the center of the left holes is $5\frac{5}{16}$. The distance from the bottom edge to the center of the bottom holes is $3\frac{1}{2}$.

A diagram of a horizontal beam of length 16. A triangular load starts at the left end with a peak intensity of $\frac{7}{32}$ and decreases linearly to zero at the right end. A point load of $\frac{5}{16}$ is applied downwards at the right end of the beam. The beam is supported by a roller support at the left end and a pin support at the right end.

#6-32 (4 INSERTS) FOR MOUNTING CIRCUIT BOARD



✓ DELAY ADJUSTMENT SCREW

THESE DRAWINGS & SPECIFICATIONS SHALL NOT BE REPRODUCED WITHOUT WRITTEN PERMISSION

[illegible]